

Zygospores of Euastrum elegans and E. pectinatum exhibited for comparison and contrast.—Mr. Archer drew attention to examples of the zygospores of two sufficiently common species of *Euastrum*, viz. *Euastrum elegans* and *E. pectinatum*. These zygospores, of course, have a strong family resemblance, not only to each other, but to other species of *Euastrum*, yet their differences of appearance, or *tout-ensemble*, were readily discernible. The zygospores in the genus are globular, and beset by usually not very numerous, often rather elongate, very slightly tapering, bluntly ending, semi-pellucid “finger-like” spines. In the *E.-elegans* zygospore they are more elongate, more curved, less numerous than in that of *E. pectinatum*, where they are thickly studded, short and straight; hence the latter makes a prettier object.

Sections of Halisarca lobularis.—Prof. Sollas exhibited a series of sections of *Halisarca lobularis*, from Roskoff, Brittany, showing the various stages of development of the young embryo within the matrical tissue.

Characters of Stamen-hairs of Narthecium ossifragum.—Mr. Greenwood Pim showed hairs from the stamen of *Narthecium ossifragum*. These hairs, which clothe the stamens very densely, are pluricellular, consisting of oblong cells, each of which shows spiral striations, and contain numerous large globules, apparently of oil, and which when fresh are of a yellow colour.

BIBLIOGRAPHICAL NOTICES.

An Elementary Course of Botany, Structural, Physiological, and Systematic. By the late Professor ARTHUR HENFREY, F.R.S., F.L.S., &c. Fourth Edition. By MAXWELL T. MASTERS, M.D., F.R.S., F.L.S., assisted by A. W. BENNETT, M.A., B.Sc., F.L.S. Van Voorst, 1884.

IF King Solomon had been pursuing his botanical studies, “from the Cedar of Lebanon to the hyssop that springeth out of the wall,” in England at the present day, he would probably, in stating that “of the making of many books there is no end,” have made special reference to the text-books of his favourite science. Out of some few good, some bad, and many indifferent text-books of botany, Dr. Masters and Mr. Bennett are to be congratulated upon having edited, and Mr. Van Voorst upon publishing, the most complete work of the kind, which represents the recent progress of the science, in our own or perhaps in any language. What faults we have to find will not, as a rule, be in matters of fact or of omission; but mainly in questions of inclusion and arrangement. The present is the fourth edition of a work that originally appeared in 1857, the second

bearing date 1870, and the third 1878. There are more than twenty excellent new woodcuts, and, besides minor alterations, the sections dealing with Algæ, Protophyta, and the reproduction of Phanerogamia have been almost entirely rewritten by Mr. Bennett; but "the general plan of the work has not been materially altered," and it is on this point that we mainly complain. In his original preface Professor Henfrey made the following remarks:—

"The largest class of students of Botany are those who pursue the subject as one included in the prescribed course of medical education. One short course of lectures is devoted to this science, and three months is commonly all the time allotted to the teacher for laying the foundations and building the superstructure of a knowledge of Botany in the minds of his pupils; very few of whom come prepared even with the most rudimentary acquaintance with the science. . . . If the previous education of medical students prepared them as it should with an elementary knowledge of the Natural Sciences we should make Physiology the most conspicuous feature of a course of Botany in a medical school." At the present day, while admitting with Professor Huxley that Botany might well be excluded from the medical curriculum, it may be urged that students entering upon that curriculum should furnish proof of attainments up to the standard of the Preliminary Scientific Examination of the University of London; and that, after studying some first book of Botany, "Physiology," which to Professor Henfrey included Histology, might well be the "most conspicuous feature" in their training. In the present work "Physiology" forms the subject of Part III., occupying but 200 pages out of a total of nearly 700, and in it are included both Embryology and Histology, the latter under the meaningless name "Physiological Anatomy." Systematic Botany (Part II.), on the other hand, occupies nearly 300 pages, only 170 of which are devoted to the multiform Cryptogamia, whilst the inclusion of such Natural Orders as Dilleniaceæ, Schizandraceæ, Lardizabalaceæ, Cabombaceæ, Sauvagesiaceæ, and such like, in a work which is not complete as a '*Genera Plantarum*,' evinces a want of discrimination between a text-book and a book of reference. Surely it would have been better to have made the present work exclusively the former, *i. e.* a work whose contents the student may hope one day to carry in his head, leaving the other function to such books as Bentham and Hooker's, or LeMaout and Decaisne's.

The only other regret of a general character that this edition suggests is the absence of bibliographical references. Controverted points are perhaps best omitted from a text-book, and a fact is undoubtedly of infinitely greater importance than the authority for it, whether ancient or recent. The plan adopted seems to have been to name recent writers only; but surely references to their chief papers, in which more detailed information can be found, would be far more valuable and need not occupy much space.

The new terminology for the Cryptogamia, proposed by Messrs. Bennett and Murray, is adopted in the latter part of the work, but not consistently used throughout, "oospore" occurring on p. 10;

and similarly, on p. 325, the *nucellus* of the ovule is alluded to as the "nucleus." The renumbering of the figures has not always been attended to; thus on p. 16 "fig. 16" should be "fig. 27," and on p. 19, figs. 22 and 19 should be 13 and 11 respectively; nor is the Index free from slips, the terms "fastigate" and "caryopsis" both occurring in it, though unaccountably omitted in the text.

The account of the various methods of branching is the best we remember to have seen, though we feel inclined to demur to the statement (p. 83) that "the difference between a dichotomy of the growing-point and lateral ramification is not fundamental," and to prefer the terms 'Racemose,' 'Pleiochasial,' and 'Unilateral,' to 'Botryose,' 'Dichasial,' and 'Sympodial' respectively; for surely the Dichasium is made up of many 'podia' equally with the 'cincinnus' and 'bostryx,' though no pseud-axis be apparent.

It might have been well in classifying the venation of leaves to bring out more prominently the importance of this character in the major groups of the higher plants; but against this omission we may set off the very useful description (on p. 74) of the bracteoles in Dicotyledons and Monocotyledons. Though we do not attach much importance to terms, perhaps 'orthostichy' and 'parastichy' might have been conveniently introduced, whilst 'opposite' seems a less confusing term than 'intrapetiolar' for such stipules as those of *Astragalus*, seeing that 'interpetiolar' is also in use, in the case of *Galium*, &c.; nor can we see why, if 'monœcious' is correct, 'heteroicisism' should be so spelt.

In the portions of Part II. relating to the Principles and Systems of Classification much matter mainly of historical interest has been omitted, as is also the table of Natural Orders in the 'Contents' of previous editions.

The arrangement adopted wisely follows Bentham and Hooker so far as flowering plants are concerned, and removes the Gymnosperms from their false position between Dicotyledons and Monocotyledons. It retains the great artificial group 'Cryptogamia,' and the convenient, though physiological classes 'Algæ' and 'Fungi,' and—as we think, very wisely—divides the vascular Cryptogams into *Heterosporia* and *Isosporia* (a point upon which Sachs seems doubtful), makes the *Charales* of equivalent rank with the *Muscineæ*, and the *Myxomycetes* on a level with *Zygomycetes*. The use of the term *Cormophyta* as an equivalent for *Acrogens*, and not in the sense originally intended by Endlicher, is a pity; and there does not seem any sufficient reason for making the Protophyta into a class co-ordinate with Algæ and Fungi, seeing that the only valid distinction between the two latter groups—namely the physiological test of the presence or absence of chlorophyll—is equally obvious as between *Protophyceæ* and *Protomyces*.

The account of the Natural Orders of Phanerogams is enriched with floral formulæ from Eichler and numerous notes on fertilization from Hermann Müller, and on floral development from Payer, besides many passages which show that this part, like the preceding

one, has been carefully brought down to date. Such are, for instance, the references to Professor Balfour's description of *Halophila* and of the wild form of *Punica*, and to Mr. Bower's account of the germination of *Welwitschia*; *Gynocardia*, the source of Chaulmagra Oil, cannot, however, be rightly referred both to the *Dilleniaceæ* and *Pangiaceæ*, nor can the Bladder-nut (*Staphylea pinnata*) be truly termed a native; whilst we must confess ourselves unable to understand Professor Gray's suggestion "that we need not consider the ovule of *Taxus* to be an axial structure simply because it is terminal, it may be a leaf 'suppressed to the utmost'." Surely a leaf cannot be truly terminal!

In the Cryptogamic portion an account of "apogamy," of the Lycopodia, of some structural details in *Sphagnum*, and of the vegetative structures of *Characeæ* are important additions; but we should like to have had more precise information as to the "remarkable and complicated structure" of the stomata in *Marchantia*. The account of the Protophyta is excellent, and much relating to the Fungi is new, as is most of the account of the Algæ. The statement that "the compound nature of Lichens has been completely established" is a stronger expression than we have seen in any English publication, but is certainly the opinion of the younger school of botanists. The logical consequence of this view would seem to be the dispersal of the group among the *Discomycetes* and *Pyrenomycetes*.

We cannot admit that among *Basidiomycetes*, "according to the most probable hypothesis, the so-called 'receptacle' is a fructification, the result of the conjugation of unknown sexual organs yet to be discovered on the mycelium," since it seems far more probable that the sexual stage has been apogamously lost.

Empusa is, by a slip, alluded to among the *Saprolegnieæ*, on p. 444.

In histology, modern researches by Strasburger on the nucleus, on the continuity of protoplasm, and by Elfving on pollen are admirably summarized, and accounts of sieve-tubes, emergences, vittæ, and other structures, passed over in the third edition, are given; whilst in the department of pure physiology more chemical detail and an account of metastasis are the chief additions. In Chapter VI. of Part III. the full account of the formation of pollen, of the embryo-sac, embryo, suspensor and endosperm, according to the newest lights, is of extreme interest.

The fourth part, devoted to Geographical and Geological Botany, is much as in former editions, allusions to Mr. Dyer's generalizations being added in the first two chapters; whilst in the third the term "Transition," long disused by geologists, is unfortunately retained: *Antholithes* is said to have "much the general appearance of an Orobanche"—a statement calculated to mislead a student into thinking that it is a case of affinity; and the Bovey Tracey lignite, which is almost certainly of Middle Eocene age, is still treated of under the head of Miocene.

These are, however, but small blemishes in a work of such wide

scope and such general excellence, and we can only hope that a fifth edition may soon be reached in which they can be attended to, and that the botanical students of the next thirty years may continue to have, as we have had, their 'Hemfrey' kept well up to date.

G. S. BOULGER.

Second Annual Report of the United-States Geological Survey to the Secretary of the Interior, 1880-81. By J. W. POWELL, Director. 4to. Pp. 588, with a large map, 61 plates of views, maps, and diagrams, and 32 woodcuts of views, sections, and diagrams. Washington: 1882.

THIS handsome and comprehensive volume contains:—I. The Director's Report, both *general*, on the Survey and its work, and *special*, on the research and results of each Head-Surveyor and his subordinates. II. Administrative Reports by the several Heads of Divisions. III. The Reports and Memoirs themselves, supplied by the officers and other members of the Survey.

The Director, in his Report on the "Plan of Publication" and "General Considerations," treats both of the nomenclature of the geological divisions, as proposed and used by Dana, Le Conte, and the Survey, and of a uniform system of colours proposed for geological cartography.

1. The first Report is on the Tertiary History of the Grand-Cañon District, by Captain C. E. Dutton. Of this a notice, together with the expression of the writer's high opinion of its great worth, has already appeared in the 'Philosophical Magazine,' 1884, ser. 5, vol. xvii. p. 551.

2. The History of Lake Bonneville, by Mr. G. K. Gilbert, who has arrived at the opinion that "first, the waters were low, occupying, as Great Salt Lake now does, only a limited portion of the bottom of the basin. Then they gradually rose and spread, forming an inland sea nearly equal to Lake Huron in extent, with a maximum depth of 1000 feet. Then the waters fell, and the lake not merely dwindled in size, but absolutely disappeared, leaving a plain even more desolate than the Great-Salt-Lake Desert of to-day. Then they again rose, surpassing even their former height, and eventually overflowing the basin at its northern edge, sending a tributary stream to the Columbia River. And last, there was a second recession, and the water shrank away—until now only Great Salt Lake and two smaller lakes remain." Thus, "there were two epochs of excessive moisture or else of excessive cold, separated by an interval of superlative dryness, and preceded by a climatic period comparable with the present." The first term of wetness was the longer, and the second was the more intense.

3. The Geology of the Eureka District, by Mr. Arnold Hague. *Ann. & Mag. N. Hist.* Ser. 5. Vol. xiv. 17

This important mining centre in Central Nevada is in the Great Basin, which consists of Palæozoic rocks (Cambrian to Carboniferous), 20,000 feet thick, extensively faulted and affected by Tertiary volcanic eruptions. A complete monograph is being prepared.

4. The Geology of Leadville, Colorado, by Mr. S. F. Emmons. The Mosquito range is rich with silver-lead ores in a Carboniferous dolomitic limestone, overlain by intrusive sheets of porphyry. They have a gangue of iron, manganese, and clay, which sometimes replaces nearly all the limestone. The whole has been uplifted, folded, faulted, and shattered, and subsequently greatly denuded. Mr. Emmons thinks that originally the metallic minerals were in the porphyries, and that percolating water took them down into the limestone, as sulphides, before the disturbances took place, dissolving the limestone away with chemical interchanges. He suggests that sulphides will be found to be more abundant lower down, but poorer in silver than near the surface.

5. The Geology of the Comstock Lode, by Mr. G. F. Becker. The high temperature in the deep sinkings of this wonderful source of silver-ore is referred by Mr. Becker, not to the kaolinization of feldspar, as has been suggested, but to a source of underground heat at more than two miles from the surface. The heat has been transmitted to the side-rocks by the lode. Some gases also are present; and the evidences show "that the immediate neighbourhood of the Comstock lode must be considered as a solfatara, now almost extinct." The ore was deposited probably "by 'lateral secretion' at or near the contact between the diorite (foot-wall) and the diabase (hanging-wall)." This is offered as the basis for practical guidance in the mine, where much money has been wasted. Mr. Becker finds that the so-called "propylite" and "quartz-propylite" are merely decomposed dioritic and hornblendic rocks. Other results of rock-change, also the structural results of faulting, the electrical activity of ore-bodies, and other interesting physical investigations, are here treated succinctly, and are to be further described in a full Report on the Comstock Lode and the Washoe District.

6. The Director mentions a History of the Comstock Lode, as being in course of preparation by Mr. Eliot Lord, not only treating of the discovery and working of these mines, but of the growth of the industries resulting therefrom, and the development of Mining Law, to which these gave rise.

7. On the Production of the Precious Metals in the United States, by Mr. Clarence King. This concise and valuable *résumé* of the statistics of the bullion production in the United States for the tenth census-year, ending May 31, 1880, precedes the intended, far more elaborate, technical Report on the Distribution and Production of the Precious Metals in the United States. The basis has been 2730 reports, from 1967 deep mines, 325 placer-mines, 327 amalgamating-mills, concentration-works, and chlorination and leaching establishments, 86 smelting-works, and 25 arrastras. The output

for the year mentioned was \$33,379,663 gold and \$41,110,957 silver, a total of \$74,490,620 (coining value). The compilation and tabulation have been made under the direction of a special expert, Mr. Albert Williams, jun. The methods followed in compilation and in the classification of mines and of reduction-works are first given. Then the statistics of the Pacific division:—California, Nevada, Utah, Arizona, Idaho, Oregon, Washington, and Alaska. Statistics of the Rocky-Mountains division:—Colorado, Dakota, Montana, New Mexico, and Wyoming. Statistics of the Eastern division. *Résumé* of reduction statistics. Coinage. Consumption in the Arts. Other estimates. Bullion-product of the World.

Colorado produces 40 per cent. of all the silver of the United States, but only 8 per cent. of the gold. California yields half of the gold, but less than 3 per cent. of the silver. The production of the precious metals in proportion to population, ranging from one mill (\$0.001) per head in Alabama, to \$278.14 in Nevada, shows with precision how far “mining is a factor of wealth in the several localities.” The product per square mile varies from 1 cent for Alaska to \$185.20 in Colorado, “the intermediate average forming another standard of developed richness in the precious metals, from a different point of view, but roughly corresponding to that of the relation of production to population.” The average fineness of gold for the United States is fixed at .876, the placers producing “over \$100,000 of silver annually in alloy with the gold—an item hitherto disregarded by statisticians.” Very clear, definite, and elucidative coloured diagrams illustrate the production- and distribution-tables above noticed.

8. A new method of measuring Heights by means of the Barometer, by Mr. G. K. Gilbert. This is a complete memoir, resulting from the author's experience in geographical work which he was obliged to take in hand when making the necessary maps for geological surveying in unmapped territories. The new method of hypsometry is so simple and direct that it has been adopted by the United States Geological Survey. Three barometers are used instead of two; two are placed at points where the heights are known, and the third is read at the point to be determined. “From the reading of the two barometers at the points of known height the weight of the intervening air-column is deduced; and, both the weight and height of the column being known, its density is computable. The density thus derived is then used in the computation of the height of a second column of air contained between one of the known points and the point to be determined.” In explaining this important barometrical discovery, Mr. Gilbert treats in full of the barometer and the principles on which its use is made practical; and of modifying conditions in the relation between air-pressure and local heights, such as density, temperature, and humidity; and of the resulting “atmospheric gradient,” diurnal, annual, and non-

periodic. The influence of wind on the tension of the air in the Observatory on Mount Washington was incidentally found to affect the barometer seriously, and even to vitiate its record. Next he describes the devices for the elimination of hypsometric errors, or for diminishing them. The "new solution" is then explained in detail and compared with other methods. Possible improvements are suggested, and some circumstances under which it is not available are carefully stated.

Eight plates of very complete and distinct diagrams illustrate altitude-determinations, with their periodic and other variations; and several useful woodcuts also help to elucidate the author's views and observations.

The mass of valuable information collected in this well-illustrated volume, put together by first-class geologists, at the cost of the liberal United States Government, and freely circulated also at its expense, is welcome to geologists and others all over the world; and we cordially recognize the heartiness of work it exhibits and the liberality with which it is distributed.

MISCELLANEOUS.

On Floral Polymorphism in Narcissus reflexus. By M. L. CRIÉ.

I HAVE the honour to indicate to the Academy a new instance of floral polymorphism in the *Narcissus* of the Glénans (Finistère). This plant, which is very rare and little known to botanists, forms part of that Breton centre of vegetation that I have characterized by *Eryngium viviparum*, *Omphalodes littoralis*, and *Linaria arenaria*.

The Glénans *Narcissus*, of which I was able to collect some hundreds of flowering specimens towards the end of April this year, appears in the island under three forms, which are very unequal in number. The first two differ in the length of the pistil and stamens.

In one the style, which is much shorter than the six stamens, raises its stigma a little way above the constriction formed by the base of the tube of the perianth. The three stamens of the inner row are shorter than the three of the outer row; it is the brachystylate form.

In the other, the style, longer than the six stamens, raises its stigma above even the three stamens of the outer row, which are the longest and the first formed (A. Chatin). This is the dolichostylate form.

This remarkable floral polymorphism in *Narcissus reflexus* has escaped the notice of Loiseleur and other botanists, who have simply indicated in this plant the difference of length which exists between